What Is Claimed Is:

1.   A method for detecting a failure sequence or other undesirable system behavior in a computer system and subsequently taking a corresponding remedial action, comprising:

    receiving instrumentation signals from the computer system while the computer system is operating;

    determining from the instrumentation signals if the computer system is in a failure sequence that is likely to lead to undesirable system behavior, such as a system crash;

    wherein the determination involves considering predetermined multivariate correlations between multiple instrumentation signals and a failure sequence that is likely to lead to undesirable system behavior; and

    if the computer system is in a failure sequence that is likely to lead to undesirable system behavior, taking a remedial action.

2.   The method of claim 1, wherein taking the remedial action involves generating an alarm.

3.   The method of claim 2, wherein generating the alarm involves communicating the alarm to a system administrator so that the system administrator can take the remedial action.

4.   The method of claim 3, wherein communicating the alarm to the system administrator involves communicating information specifying the nature of the failure sequence to the system administrator.

14

1   5.   The method of claim 1, wherein taking the remedial action can

2 involve: killing processes, blocking creation of new processes, or throwing away

3 work, until the system is no longer in a failure sequence that is likely to lead to

4 undesirable system behavior.

1   6.   The method of claim 1, wherein determining if the computer

2 system is in a failure sequence involves:

3   deriving estimated signals for a number of instrumentation signals,

4 wherein each estimated signal is derived from correlations with other

5 instrumentation signals; and

6   comparing an actual signal with an estimated signal for a number of

7 instrumentation signal to determine whether the computer system is in a failure

8 sequence.

1   7.   The method of claim 6, wherein comparing an actual signal with an

2 estimated signal involves using sequential detection methods to detect changes in

3 a relationship between the actual signal and the estimated signal.

1   8.   The method of claim 7, wherein the sequential detection methods

2 include the Sequential Probability Ratio Test (SPRT).

1   9.   The method of claim 6, wherein prior to deriving the estimated

2 signal, the method further comprises determining correlations between

3 instrumentation signals in the computer system, whereby the correlations can

4 subsequently be used to generate estimated signals.

1   10.   The method of claim 9, wherein determining the correlations

2   involves:

3   deliberately overloading the computer system during a test mode to

4   produce undesirable system behavior, such as a system crash; and

5   identifying multivariate correlations between multiple instrumentation

6   signals and the system crash.

1   11.   The method of claim 9, wherein determining the correlations

2   involves using a non-linear, non-parametric regression technique to determine the

3   correlations.

1   12.   The method of claim 11, wherein the non-linear, non-parametric

2   regression technique can include a multivariate state estimation technique.

1   13.   The method of claim 1, wherein the instrumentation signals can

2   include:

3   signals associated with internal performance parameters maintained by

4   software within the computer system;

5   signals associated with physical performance parameters measured

6   through sensors the computer system; and

7   signals associated with canary performance parameters for synthetic user

8   transactions, which are periodically generated for performance measuring

9   purposes.

1   14.   A computer-readable storage medium storing instructions that

2   when executed by a computer cause the computer to perform a method for

3   detecting a failure sequence or other undesirable system behavior in a computer

16

4   system and subsequently taking a corresponding remedial action, the method

5   comprising:

6   receiving instrumentation signals from the computer system while the

7   computer system is operating;

8   determining from the instrumentation signals if the computer system is in

9   a failure sequence that is likely to lead to undesirable system behavior, such as a

10   system crash;

11   wherein the determination involves considering predetermined

12   multivariate correlations between multiple instrumentation signals and a failure

13   sequence that is likely to lead to undesirable system behavior; and

14   if the computer system is in a failure sequence that is likely to lead to

15   undesirable system behavior, taking a remedial action.

1   15.   The computer-readable storage medium of claim 14, wherein

2   taking the remedial action involves generating an alarm.

1   16.   The computer-readable storage medium of claim 15, wherein

2   generating the alarm involves communicating the alarm to a system administrator

3   so that the system administrator can take the remedial action.

1   17.   The computer-readable storage medium of claim 16, wherein

2   communicating the alarm to the system administrator involves communicating

3   information specifying the nature of the failure sequence to the system

4   administrator.

1   18.   The computer-readable storage medium of claim 16, wherein

2   taking the remedial action can involve: killing processes, blocking creation of new

17

3   processes, or throwing away work, until the system is no longer in a failure

4   sequence that is likely to lead to undesirable system behavior.

1   19.   The computer-readable storage medium of claim 14, wherein

2   determining if the computer system is in a failure sequence involves:

3   deriving estimated signals for a number of instrumentation signals,

4   wherein each estimated signal is derived from correlations with other

5   instrumentation signals; and

6   comparing an actual signal with an estimated signal for a number of

7   instrumentation signal to determine whether the computer system is in a failure

8   sequence.

1   20.   The computer-readable storage medium of claim 19, wherein

2   comparing an actual signal with an estimated signal involves using sequential

3   detection methods to detect changes in a relationship between the actual signal

4   and the estimated signal.

1   21.   The computer-readable storage medium of claim 20, wherein the

2   sequential detection methods include the Sequential Probability Ratio Test

3   (SPRT).

1   22.   The computer-readable storage medium of claim 19, wherein prior

2   to deriving the estimated signal, the method further comprises determining

3   correlations between instrumentation signals in the computer system, whereby the

4   correlations can subsequently be used to generate estimated signals.

1   23.   The computer-readable storage medium of claim 22, wherein

2   determining the correlations involves:

3   deliberately overloading the computer system during a test mode to

4   produce undesirable system behavior, such as a system crash; and

5   identifying multivariate correlations between multiple instrumentation

6   signals and the system crash.

1   24.   The computer-readable storage medium of claim 22, wherein

2   determining the correlations involves using a non-linear, non-parametric

3   regression technique to determine the correlations.

1   25.   The computer-readable storage medium of claim 24, wherein the

2   non-linear, non-parametric regression technique can include a multivariate state

3   estimation technique.

1   26.   The computer-readable storage medium of claim 14, wherein the

2   instrumentation signals can include:

3   signals associated with internal performance parameters maintained by

4   software within the computer system;

5   signals associated with physical performance parameters measured

6   through sensors the computer system; and

7   signals associated with canary performance parameters for synthetic user

8   transactions, which are periodically generated for performance measuring

9   purposes.

19

1   28.   An apparatus that detects a failure sequence or other undesirable

2   system behavior in a computer system and subsequently takes a corresponding

3   remedial action, comprising:

4   a monitoring mechanism configured to monitor instrumentation signals

5   from the computer system while the computer system is operating;

6   a determination mechanism configured to determine from the

7   instrumentation signals if the computer system is in a failure sequence that is

8   likely to lead to undesirable system behavior, such as a system crash;

9   wherein the determination mechanism is based on multivariate

10   correlations between multiple instrumentation signals and a failure sequence that

11   is likely to lead to undesirable system behavior; and

12   a remediation mechanism that is configured to take a remedial action if the

13   computer system is in a failure sequence that is likely to lead to undesirable

14   system behavior.

15

20